

Building Periods for Use in Earthquake Resistant Design Codes – Earthquake Response Data Compilation and Analysis of Time and Amplitude Variations

Acknowledgements





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Summary

Most seismic building codes estimate the design forces in structures based on the seismic coefficient $C(T)$, where T is the “fundamental vibration period of the building.” For structures on flexible soil, the relative response is the largest at the first period of the soil-structure system, which should be substituted in the code equation. This period depends not only on the structure itself, but also on the properties of the foundation system, of the surrounding soil, and on the contact conditions between the foundation and the soil. Studies for selected buildings have shown that this period can vary significantly during earthquake shaking as function of the level of shaking, reflecting changes in stiffness of the structure and of the soil (permanent or temporary), and changes in the bonding between the foundation and the soil, and can be very different from the estimates using ambient vibration data. For further refinement of the existing and development of new design code procedures, it is important to understand these changes and estimate their range during *strong* earthquake shaking, which is done best by analysis of actual earthquake response data for a large number of buildings.


This web site presents results of a one year project, which involved compilation of new and gathering and analysis of existing processed strong motion data of building responses in the Los Angeles area, and in particular of buildings that recorded the 1994 Northridge earthquake and aftershocks, with the objective to estimate the variation of the first system frequency as a function of the level of shaking and time.

Publications

- Todorovska, M.I., T.-Y. Hao and M.D. Trifunac (2004). “Building Periods for Use in Earthquake Resistant Design Codes – Earthquake Response Data Compilation and Analysis of Time and Amplitude Variations,” Department of Civil Engineering Report CE 04-02, University of Southern California. Main body , Appendix A , Appendix B 
- Todorovska, M.I., T.-Y. Hao and M.D. Trifunac (2004). “Variability of Soil-Structure System Frequencies during Strong Earthquake Shaking for a Group of Buildings in Los Angeles Estimated from Strong Motion Records,” Proc. Third UJNR Workshop on Soil-Structure Interaction, March 29-30, 2004, Menlo Park California. 

Data Release

Processed data (Volume 1, 2 and 3) for seven buildings can be downloaded free of charge via anonymous ftp from: ftp://cwis.usc.edu/pub/todorovs/USGS_build/. The only condition on the use of these data is the courtesy to acknowledge the data sources (see the following section). The files are organized by USGS station number. Sample programs to read the files can be downloaded from: ftp://cwis.usc.edu/pub/todorovs/North_aft_M5/tools. A summary of the data processing methods can be found in:

■ Todorovska, M.I., and V.W. Lee (2004). "Strong Motion data processing and recording at University of Southern California," Proc. Invited Workshop on Strong-Motion Record Processing, Organized by Consortium for Strong Motion Observation Programs (COSMOS), May 26-27, 2004, Richmond, California. 

List of buildings:

Station	Address	Coordinates
USGS: 0466, SMA-1 185	Los Angeles, 15250 Ventura Blvd., Roof (13th floor)	34.157°N, 117.476°W
USGS: 5108 SMA 1276 and 1277	Canoga Park, Santa Susana, ETEC Bldg 462 (6th and 1st floors)	34.230°N, 118.712°W
USGS: 5450, SMA-1 6146	Burbank, 3601 West Olive Ave., Roof (9th floor)	34.152°N, 118.337°W
USGS: 5451, SMA-1 4048	Los Angeles, 6301 Owensmouth Ave., Roof (12th level)	34.185°N, 118.584°W
USGS: 5453, SMA-1 7073	Los Angeles, 5805 Sepulveda Blvd., Roof (9th floor)	34.175°N, 118.465°W
USGS: 5455, SMA-1 4270	Los Angeles, 16000 Ventura Blvd., Roof (13th floor)	34.156°N, 118.480°W
USGS: 5457, SMA 5491	Los Angeles, 8436 West 3rd St., Roof (10th floor)	34.072°N, 118.375°W

Acknowledgement of Data Sources

Users are kindly requested to acknowledge the sources of these data - USGS Strong Motion Program, which maintains the archives of these records, and the University of Southern California - Strong Motion Research Group, which processed the records.

Contact

Maria I. Todorovska
University of Southern California
Civil Engineering Department
Los Angeles, CA 90089-2531
Tel. (213) 740-0616; fax. (213) 744-1426; E-mail: mtodorov@usc.edu

Links

[USC Strong Motion Research Group](#)
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